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# USSR Report

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## RAIL SYSTEMS

### NOVOCHERKASSK ELECTRIC RAIL WORKS HISTORY, MODERNIZATION

#### History of Works

Moscow ELEKTRICHESKAYA I TEPLOVOZNAYA TYAGA in Russian No 4, Apr 86 pp 9-12

[Article by V. I. Duvarov, director of the Novo cherkassk Electric Locomotive Works, and V. P. Lebedev, deputy chief engineer, under the rubric "Flagship of Domestic Electric Locomotive Building: The Novocherkassk Electric Locomotive Works Is 50 Years Old": "The Plant Yesterday, Today, and Tomorrow"]

[Text] Thousands of consists rush over the country's steel mainlines each day; some are delivering millions of tons of freight to consumers, and passengers are travelling in others. Powerful electric locomotives, many of which the Novocherkassk Electric Locomotive Works (NEVZ) built, are pulling them. The works celebrates its fiftieth anniversary this month.

The history of the construction of the Novocherkassk Works begins with November 1932 when the Lokomotivstroy station flat-car appeared on the Don steppes near Novocherkassk. The child of the first five-year plan -- a steam locomotive works -- was born here.

The enterprise began to produce the first industrial steam locomotives on 27 April 1936. They were built until the beginning of the Great Patriotic War. Then the plant began to produce military products.

The Novocherkassk Steam Locomotive Works was reconstructed into an electric locomotive works after the war's end. It produced a new item in 1947 -- the VL22M six-axle, mainline, direct-current electric locomotive with a power rating of 2,400 kilovolts. The Moscow Dinamo Works had developed their design before the war. Serial production of the locomotives continued until 1958.

The CPSU Central Committee and the Soviet government have been constantly concerned about increasing the enterprise's capacity. Even when starting to organize the new works, a detail design, which was intended for the production of a large number of mainline electric locomotives, was approved on the basis of the steam locomotive works.

VL22M electric locomotives ceased to satisfy operating requirements with the expansion of the electrified lines and the increase in freight turnover. That



is why the radically new VL8 (N8) eight-axle, two section locomotive with a  $2_0+2_0+2_0+2_0$  axle formulation was constructed by the Novocherkassk Electric Locomotive Works in 1953. Its power rating in the hourly mode was 4,200 kilovolts. Based on the VL8 electric locomotive, they designed the VL23 six-axle locomotive with a power rating of 3,150 kilovolts in 1956 for operations on less heavily loaded lines with level contours. They produced them until the needs of the railroads for such electric locomotives were completely satisfied.

The first Novocherkassk locomotives were built considering the latest -- at the time -- achievements of science and technology, the capabilities of the electrical engineering and affiliated branches of industry, and the achievements of electric locomotive building abroad. This method for designing new locomotives, which has proved itself in practice, is also being used now.

The previously unheard of rates in electrifying the railroads, which were achieved after the adoption of the general plan for the electrification of the railroad, required the production of a large number of direct and alternating-current electric locomotives. The Novocherkassk Electric Locomotive Works was reconstructed in 1959 for this purpose.

A scientific research institute for electric locomotive building was organized to conduct research and development. It was later renamed the All-Union Scientific Research Planning and Design and Technological Institute for Electric Locomotive Building (VEINII) and made a leading institute in the electric locomotive building sub-branch. All of this permitted the Novocherkassk works to increase the output of mainline electric locomotives almost fourfold. Whereas the overall power rating of produced locomotives was 540,000 kilovolts in 1956, it grew to 1,877,200 kilovolts in 1966.

Electric traction using direct current was introduced during the first stage of the railroads' technical reconstruction. During the Fifties, our native industry mastered the production of mercury-arc single-anode rectifier units with water-cooled ignitrons. This permitted work to be begun on designing single-phase alternating-current electric locomotives. The first six-axle, alternating-current, mainline electric locomotives -- the VL61 (NO)-- were produced in 1954.

Based on the experience acquired in operating them on test lines electrified with alternating current having a voltage of 25 kilovolts and a commercial mains frequency of 50 hertz, they designed the VL60 six-axle, alternating-current electric locomotive with a power rating of 4,140 kilovolts. Based on its power rating, traction force and speed, the new locomotive came close to the VL8 eight-axle, direct-current electric locomotive, and based on its weight, it was lighter by 30 percent. Since then, the Novocherkassk Electric Locomotive Works has specialized in the production of alternating-current electric locomotives.

During 1961-1964, the production of VL60R six-axle, alternating-current electric locomotives with ignitron regenerative braking and VL60K with a silicon rectifier, which were developed by the VEINII, was mastered. The power rating of each locomotive was 4,590 kilovolts; its weight -- 138 tons; and its maximum speed -- 110 kilometers per hour.

The high rates of increase in freight turnover during the Sixties and the need to increase the weight and speed of trains, which was caused by them, called for a sharp increase in the unit power rating of locomotives. That is why the Novocherkassk works stopped producing six-axle electric locomotives in 1963. It only made powerful eight-axle freight electric locomotives in a two-section version during the 9th and 10th five-year plans.

From 1964 to 1970, the works built the VL80K eight-axle, alternating-current electric locomotives with silicon rectifiers, which had been developed by the VEINII. Their power rating in the hourly mode was 6,520 kilowatts, their speed -- 54.6 kilometers per hour, and their traction force -- 45.1 tons-force.

VEINII (in cooperation with scientists from the Moscow Energetics Institute and the All-Union Scientific Research Institute for Rail Transport) designed the VL80T electric locomotive with rheostatic braking based on the VL80K locomotive. Its main technical characteristics were similar to the characteristics of the latter. The use of rheostatic braking permitted the average speed between stops to be increased and the movement safety of trains to be raised as a result of the pneumatic brakes being constantly ready for action. The Novocherkassk works was awarded the Order of Lenin in 1971 for the successes that it had achieved in assuring the delivery of modern electric locomotives in the required amount and with the necessary quality to transport.

The further improvement in the design of alternating-current electric locomotives occurred both in the USSR and abroad by incorporating thyristor equipment. During 1974-1979, the Novocherkassk works produced a batch of radically new electric locomotives -- the VL80R. These were eight-axle electric locomotives with even control of the voltage in the traction engines and regenerative braking. The power rating of the locomotive in the hourly mode was 6,520 kilowatts; tractive force -- 45.1 tons-force; and speed -- 51.6 kilometers per hour.

The problem of incorporating regenerative braking on rectifier alternating-current electric locomotives was solved for the first time in world locomotive-building practices with the building of this electric locomotive. Incidentally, it has still not found an outlet abroad. For example, the best foreign electric locomotive VV15000 (the [Alstom] firm in France) is equipped with rheostatic regenerative braking. Regenerative braking is assured for only half of the engine's power rating, whereas the Soviet locomotive is assured for the full power rating. VL80R electric locomotives have been produced serially since 1980.

The serial production of VL80S electric locomotives was mastered in 1980 in order to improve shipping operations on freight-heavy lines. Their electrical schema permits the joining of locomotives consisting of two, three and four sections which one locomotive crew controls from the leading cab. There is another important advantage to the new electric locomotives here -- besides increasing the traffic capacity of the railroads, the requirement for engineers and their assistants is reduced.



With the shift to producing VL80S machines, it became possible to drive heavy consists weighing 6,000-8,000 tons depending on the route's contour. Each electric locomotive of this type permits more than 46,000 brigade-hours to be saved during operations. The overall economic effect from the production and use of the locomotive is almost 150,000 rubles a year.

The accumulated scientific, technical and production potential has contributed to the Novocherkassk works producing mainline electric locomotives for the foreign market. The works have been exporting the S1 four-axle, alternating-current, universal electric locomotive, which VElNII developed, to Finland since 1973. Later, it began to deliver ET42 eight-axle, direct-current electric locomotives to the Polish People's Republic. The Novocherkassk works was awarded the international Golden Mercury prize in 1980 for expanding international economic, scientific, technical, and production ties.

The significant increase in industrial production and the construction of electrical power stations, heavy industry enterprises and new quarries and opencast collieries predetermine the increase in shipping volumes not only on mainline transport but also on industrial transport. At the present time, the overall length of industrial transport railroads in the USSR is more than 130,000 kilometers and freight turnover is approximately 74 billion ton-kilometers. In connection with this, the Novocherkassk works has been producing powerful traction assemblies for transporting freight in openpit mines since 1969 in addition to mainline electric locomotives.

The Novocherkassk works and the VElNII have designed all of the domestic models of mainline and industrial electric locomotives with a consideration for the achievements of science and technology and also with a consideration for world practices. That is why they are on a level with the best foreign locomotives based on their engineering designs and even exceed them in a number of parameters.

A characteristic feature of the work, which is performed in the works is the search for new design and technological solutions that would raise the technical level and quality of the items being produced and increase production under the conditions of the re-equipping and prolonged reconstruction of the enterprise.

Together with the Ministry of Railways Locomotives Main Administration, the specialists in the works and the VElNII Institute annually compile measures to increase product reliability and quality, eliminate shortcomings in the work of the assembly units, and revise the design and technical documentation. Joint control is exercised over their fulfillment.

The introduction of an electrical circuit, which insures the operation of many VL80S electric locomotive units composed of three sections on the system, and the change in the design and technologies for manufacturing the bar suspension assembly, which increases its wear resistance, are among the more important ones. Resistor-diode shunting networks have been incorporated in the coils of the control circuits to lower the overvoltage to a level of 500 volts.

The introduction of advanced technologies and production mechanization and automation has contributed to a considerable degree to the successful building of electric locomotives with high technical and economic indicators. Thus, the works has introduced a new system for the accelerated technological preparation of production, which is based on the broad use of re-programmable equipment and the development of methods for handling items based on groups and types of production processes.

An automated control system (ASU) based on continuous operational and production planning has been designed, developed and improved. At first, they used the Minsk-23 computer here, but now they are using a single series machine -- the YeS-1022. All of this has contributed to the fact that the state Seal of Quality is attached to the produced mainline and industrial electric locomotives, including those being exported, during certification.

The program directions of the 27th CPSU Congress -- the decisive shift of the national economy to an intensive path of development -- means for railroad workers not only the re-equipping of the branch on a new technical basis but also the accurate fulfillment of the plan for transporting national economic cargo of all types, the steady lowering of expenditures, and an increase in the weight, length and speed of consists.

In order to solve this task successfully, the Novocherkassk works and the VEINII have created the VL85 12-axle, two-section, alternating-current, mainline electric locomotive. A qualitatively new step has been made in domestic electric locomotive building. The complexities, which arose during this, were explained by the absence of experience in building such locomotives not only in our country but also abroad. During the work on the problem, broad-based scientific, design, technological, technical, and economic research was performed in order to select the optimum designs for the construction of the undercarriage and power circuit, the automation of control, the arrangement of equipment, etc.

At the same time, they tried to improve the traction and power characteristics and reduce the electric locomotive's specific material-intensiveness and its labor-intensiveness during manufacturing and repairs. They devoted a great deal of attention to increasing the locomotive's dependability and creating designs to operate under the conditions of the Baykal-Amur Main Line where temperatures reach minus 60° centigrade.

Based on its power rating and tractive force, the VL85 electric locomotive exceeds the serially produced VL80S and VL80R machines 1.54-fold; the specific material-intensiveness of the new electric locomotive is lower by 11 percent; and the specific labor-intensiveness during manufacturing -- by 12-15 percent. The national economic effect from introducing each VL85 locomotive is 194,700 rubles.

In implementing the decisions to accelerate scientific and technical progress in the national economy, the collectives of the VEINII and the Novocherkassk works have adopted high socialist obligations. In particular, these provide for the start of VL85 electric locomotive serial production two years before the prescribed time.

A further increase in the power rating and tractive force of electric locomotives while maintaining the axle load on the rails within existing limits can be achieved by using collector-free traction engines. That is why the works and the institute are now performing work to design locomotives with an asynchronous engine. One of the versions, which has received the designation VL86F, was developed in cooperation with the Finnish (Stremberg) firm and was produced in 1985.

The use of asynchronous traction engines will permit the collector and brush apparatus, which requires a large amount of non-prestigious and labor-intensive work and preventive and repair operations, to be gotten rid of. To a certain degree, this will provide an opportunity to solve such an important social problem as the shortage of repair personnel on the railroad network. The economic effect from introducing and operating one VL86F electric locomotive should be 133,600 rubles according to preliminary estimates.

The works now has no equal in the world based on production scales. It has at its disposal not only highly qualified workers but also experienced designers, industrial engineers and scientists. Modern technical equipment, a computer center and the necessary research laboratories and stations are at their disposal.

The plant is devoting a great deal of attention to searching for new and advanced methods for building locomotives. Together with VEINII scientific workers, the enterprise's specialists have developed and introduced approximately 2,000 manufacturing methods for blank-forming and die-stamping production. They have proposed a new process for drying the windings in the frames of the traction engines, more improved methods for marking the wires and panels of the equipment on electric locomotives, and a process for manufacturing the Monolit-2 insulators using non-volatile accelerators.

During 1985 alone, the works' technical services developed 148 measures that insured the monitoring of the quality of the produced items. For example, they now use a special stand to test many units of the VL80S three-section electric locomotives for the system. A device was installed to control the running of the armature in the assembled NB-418K6 engine.

They have been using objective monitoring of the forced fitting of the armature sleeve and collectors on the engine shaft for a long time. At the same time, the recording instrument's tape registers the force of the forced fitting. One can consider the 100-percent monitoring of the fitting surfaces of the sleeves on the rod of the bar suspension and the 100-percent monitoring of the quality in manufacturing the members of the spring system as a great success of the designers.

The betterment of the manufacturing process and the improvement of the quality of produced electric locomotives are being carried out systematically. New and more advanced and reliable materials and modern technological methods for the manufacturing, mechanization and automation of production processes are being constantly applied. The introduction of highly efficient equipment and advanced technologies and equipment has become a rule for the plant workers.



The enterprise's production capacities are being constantly updated with the increase in the production of electric locomotives. You see, up to 60,000 items must be manufactured for each locomotive. The machine-tool inventory is being intensively updated in many operating sections. Dozens of mechanized production lines and complex mechanized sections have been created and are operating successfully.

During the last three years alone, more than 300 units of new technological equipment have been incorporated into metal processing and electrical engineering facilities. The equipment unit sets for manufacturing traction engine frames and undercarriage items for electric locomotives are among them.

Close coordination links the plant workers with the scientists in the Novocherkassk Polytechnical Institute. Together with them, the plant's specialists have undertaken to incorporate industrial robots. They will completely handle the stamping presses, having replaced man. Two semiautomatic lines for the slitting of rolled steel are operating here. A total of 15-16 tons of metal are processed during a shift on one of these lines.

At the present time, the Novocherkassk works has concentrated the main percentage on building mainline locomotives. Besides them, the plant produces industrial units, spare parts, low voltage units, and consumer goods. The actual capacity of the enterprise exceeded the design output in 1977. Thus, sharply increasing the output of the electric locomotives needed by the country became very complicated. That is why a specific program for expanding production capacities at the Novocherkassk Electric Locomotive Works has been outlined.

In accordance with it, it is planned to reconstruct and technically re-equip the enterprise in two stages before 1995. In this regard, a gradual shift in the nomenclature of produced machines is being provided for. During the reconstruction, automated systems for controlling manufacturing processes will be incorporated and automatic complex mechanized lines and sections will be organized in blank-forming facilities.

Production lines for manufacturing bodies will be created in assembly and welding facilities and item closed-loop mechanized sections for manufacturing the bulky units of multi-item mechanized production lines -- in electrical engineer facilities. The processes of applying lacquer dye coverings, loading and unloading operations and a number of other advanced production operations will also be mechanized and automated. Much of what has been listed has been completed or is close to completion.

The determinant factors in developing Soviet electric locomotive building in the near future are: increasing the axle power of electric locomotives and their speed, using high quality construction and insulation materials, and introducing advanced technology and complex mechanization and automation into production processes. In connection with this, the Novocherkassk works has planned during the 12th Five-Year Plan to create a new generation of 12-axle, alternating-current electric locomotives and to introduce a traction drive with collector-free traction engines.

They are providing for the development of circuits, designs and assembled units and materials that insure the operation of electric locomotives under cold climate conditions. They are exerting a great deal of effort in searching for ways to improve the traction characteristics of the electric locomotives, which have been designed, for the purpose of decreasing the energy-intensive-ness of shipments and the expenditure of material and labor resources for their manufacturing and operation.

Each of these avenues includes within it different concrete tasks and problems whose successful solution will permit the Novocherkassk electric locomotive builders to develop new advanced mainline electric locomotives with a high technical level and quality. In a word, in implementing the party's decisions, they have set a firm course toward technical progress. The sum total of these measures will insure a 1.5-2-fold increase in labor productivity in the plant, depending on the type of production, and a 1.6-1.8-fold decrease in labor-intensiveness. Approximately 7,000 individuals will be conditionally released.

The Novocherkassk Electric Locomotive Works has travelled a great path during the 50 years of its development -- from the building of steam engines and VL22M electric locomotives to the construction of a large number of powerful direct-current and alternating-current locomotives for various purposes in order to satisfy the country's need and export deliveries.

The workers of the Moscow Dinamo plant called Soviet electric locomotives by the name of their leader during the first five-year plan. Today, the Novocherkassk electric locomotive builders, who have been singled out by the country's highest award -- the Order of Lenin -- for their creative work, also call them today by the name of their leader.

The many years of experience in building different types of electric locomotives and the existing scientific and production potential provide a basis for stating on the eve of the works' 50th anniversary that the Novocherkassk electric locomotive builders are ready to satisfy the requirements of the operators and that they will make a worthy contribution to the fulfillment of the historic decisions of the 27th CPSU Congress.

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#### Modernization of Plant

Moscow ELEKTRICHESKAYA I TEPLOVOZNAYA TYAGA in Russian No 4, Apr 86 pp 12-15

[Article by Ye. Sh. Yurkovetskiy, Novocherkassk Electric Locomotive Works' chief product engineer, under the rubric "Flagship of Domestic Electric Locomotive Building: The Novocherkassk Electric Locomotive Works Is 50 Years Old": "New Technology: Tasks and Prospects-- The Reconstruction of the Novocherkassk Electric Locomotive Works Is Under Way"]

[Text] The Soviet people have adopted a course to accelerate scientific and technical progress. Complex and critical tasks face the workers of the Novocherkassk Electric Locomotive Works (NEVZ). During the 12th Five-Year Plan, the factory will basically produce locomotives of a new generation -- the VL85 twelve-axle, alternating-current electric locomotives with a great number of electronics, a constructively changed undercarriage and a number of other innovations.



Considering this, the Novocherkassk plant is undergoing reconstruction. A radical re-equipping of the plant will take place. This will permit the technology for manufacturing electric locomotives to be raised to a qualitatively higher level and highly mechanized production, which satisfies modern requirements and which simplifies the labor of personnel, to be established.

The country's research and development organizations are providing a great deal of help in the reconstruction. Thus, the All-Union Research and Development Institute for Electrical Equipment (Kharkov) was entrusted with developing the designs for re-equipping assembly facilities; the All-Union Design and Construction Institute for Electrical Engineering Production Technology (Leningrad) -- mechanical processing facilities; and the All-Union Research and Development Institute for Electric Machinebuilding Technology (Baku)-- for stamping facilities. The Novocherkassk Polytechnic Institute and the All-Union Research and Development and Technological Institute for Electric Locomotive Building have completed several designs for the use of robots.

The plan for the technical re-equipping of the works was developed in connection with the coming production of VL85 electric locomotives. Its measures are basically aimed at reducing labor-intensiveness, decreasing the percentage of manual labor, and increasing product quality. The plan provides for the introduction of robotic complexes (RTK) and the creation of flexible automated re-programmable systems (GAPS). The plant workers should receive five robotic complexes based on the model 16K20F3 lathe this year. They intend to use them in the fastening workshop during the machining of collector bolts and in equipment facilities during the machining of items of the "axle", "shaft", and "flange" type.

The introduction of robotic complexes, modules and flexible systems, whose overall number should reach 26 units, is planned for the future. Among them there must be GAPS for manufacturing the frames of traction engines, axles, pinions, wheel spiders, bar suspension rods, and other items in the electrical machinery, wheel, bogie, and equipment workshops.

At the present time, there are several thousand assemblies and items which differ for the types of electric locomotives, processing batches, geometric shapes and technical complexity in mechanical processing facilities. Unit, special and automatic equipment complexes are used during the processing of serially-produced items (the undercarriage, electric machines, apparatuses, and mountings). The simultaneous multi-instrument processing of several items, including those of several designations, is characteristic of them.

Thus, the AM0926 complex processes eight different items for an electric locomotive's undercarriage simultaneously using 75 spindles with a different tool located on four unit-type spindle heads. Items are moved automatically in an attachment from one unit-type spindle head to another. The heads are located in a circle. This permits the complex to be serviced by one worker who loads the blanks and lowers the finished items.

In order to decrease intra-and inter-shop shipments, it is planned to build a whole series of lines, sections and production facilities based on the item closed-loop manufacturing cycle, having equipped them with highly efficient equipment. Here are some of them:

Mechanized production lines for the manufacturing of wheel-pair axle casings and bar suspension items in the bogie shop;

a complex mechanized section for the manufacturing of M20-M48 bolts from rod-shaped rolled stock with a diameter equal to the thread rolling and with the head formed by waste-free stamping on presses with local induction heating.

Production lines which incorporate modular assembly methods, are being built in the assembly facilities. They are being combined with brigade methods for organizing labor and the mechanization of assembly and installing operations (the cold molding of cable lugs instead of soldering, the flow soldering of the radio-electronic apparatus's circuits, etc.).

In the cold stamping facilities, by-element and multi-operation stamping is being substituted everywhere in the processing on special multi-position and multi-operation dies. This insures a significant increase in labor productivity, especially when combined with the use of automatic presses. The concentrating of cold-stamping and blank-nesting facilities in one building permits more advanced equipment to be incorporated and allows it to be interlocked into production lines.

The stamping of all large items has been shifted to rolled material using automatic presses. When doing this, the parts of the cores made of electrical-sheet steel are automatically restored to shape. All of the main iron sheets in the traction engine armature are manufactured using mechanized complexes in which the output of the die and the piling of the finished parts are carried out by the automatic prefabrication operator.

It is appropriate to note here that these measures provide a high level of effectiveness only when the facilities have been thoroughly prepared technically. Thus, the use of rolled material required the incorporation of three mechanized lines for its cutting and the location and spacing of blanks and 20 automatic presses. The increase in labor productivity of more than twofold during the manufacturing of parts led to a sharp increase in rejects. This required that their disposal be mechanized and that they be reworked directly in the shop. As a result of the introduction of all the mentioned measures, a branch commission certified the level of technology in the cold-stamping facilities to be in the highest category.

Further improvements in technology will be aimed at using presses with numerical control programs (ChPU) and building stamping sections using industrial robots. For example, equipment complexes with numerical control programs and an automatic line for the cross-cutting of the rolled steel must be incorporated in the blank-nesting and blank-forming facilities. They are planning to install and start in production a revolving position press with a control program for small lot parts which have projections and openings of different configurations.

On the whole, the branch commission certified the level of production technology to be in the first category in September 1984; seven workshops and sections were in the highest one. The level of use of standard technological processes and standard re-programmable equipment is 43 percent. The percentage of advanced equipment in the overall pool is equal to 27 percent. At the present time, 39 production lines, 37 mechanized production lines, 4 automatic lines, and 33 complex mechanized sections are functioning in the plant. During the 12th Five-Year Plan, the plant workers will continue to improve technology actively. The pool of machine tools with numerical control programs will also be further expanded. The percentage of special and other types of advanced equipment will increase to 40 percent. Manufacturing processes will be improved by mechanizing and automating and by using robots.

The works must begin serial production of the NB-514 traction engine instead of the NB-418K6 and the NB-511 instead of the DT-9N. Their design is based on using new materials and production methods and is better suited to the conditions of large-scale serial production. Many assemblies and components have been considerably unified with those that have been mastered. Moreover, the reconstruction of the existing traction engine facilities with their considerable specialization and the organization of closed-loop mechanized production lines and sections for manufacturing and assembly is being provided.

They have improved technology during recent years in the winding, insulation and electric machine facilities by basically incorporating new insulating and conducting materials. Thus, they have begun to use insulated wires for the armature and pole coils and they have started to use strips previously impregnated with different compounds for the housing insulation and new insulation of the Monolit-2 and Monolit-4 type. This has permitted the cycles for manufacturing the assemblies for the electrical machines and apparatuses to be reduced, labor productivity to be raised, and the output of products to be increased without increasing the number of workers.

Within the next few years, it will be necessary to improve the technologies for using the new materials and to mechanize manual labor as much as possible during their use. This is one of the main tasks in raising production efficiency and in increasing the output of products.

It is necessary to manufacture and incorporate machine tools for the mechanical molding of equalizer sections for traction engine armature windings and to shift the insulating of the sections completely to semiautomatic machine tools. Machine tools for the mechanized covering of pole coils with insulation and putting casing insulation on the compensating winding coils will be manufactured and introduced, the covering of equipment coils with polyurethane insulation on the GN41-12 press instead of manual insulation with strips will be introduced, etc. All of this will permit the output of assemblies for the electric machines and apparatuses to be increased without increasing the size of the area and the number of workers.

No less serious tasks face the production of parts from plastic. Whereas they previously improved production mainly by incorporating multi-seat molds

and shifting parts from thermal reactive material molding to automatic casting presses, the use of new advanced equipment -- rotor multi-position presses and plastic heat softening automatic machines with a larger volume injection chamber -- has become the main avenue during recent years.

It is also necessary to reorganize radically the methods for finishing items made of plastic. Special machine tools will be introduced and new equipment, which insures the maximum shortening of the finishing process, will be developed and introduced.

During the next few years, painting methods will substantially change in all of the plant's shops by installing modern imported painting and drying equipment, incorporating the painting of parts and assemblies in an electrostatic field, and by using water-soluble, non-combustible enamels that are applied using an electrophoretic method on automated lines. Complex mechanized lines for the removal from dead storage, the preparation and the priming of the sheet and shaped stock and casings must be mounted in body shop No 2 and in the blank-nesting and blank-forming section.

During the next five-year plan, the electroplating building, in which all technological operations will be performed on mechanized lines and automated lines, must be commissioned. The preparation of items for coating; the preparation, distribution and monitoring of the condition of the electrolytes and their recovery; and the cleaning of waste water will also take place automatically.

There are processing centers for manufacturing parts using more modern equipment. The Ministry of the Machine Tool and Tool Building Industry has now developed such machine tools for average-size components whose processing includes milling, drilling and thread cutting. There is another series of machine tools intended for boring and grinding. Processing centers for forming components with tool sets for die-cutting, milling and thread-cutting are being designed.

Good experience has already been accumulated now in using processing centers of the S-500 type in electric machine shop No 2. Thanks to it, multi-tool servicing has been introduced, labor productivity increased, and the cost of manufacturing components reduced by 3,000 rubles a year. The combining of milling, drilling and countersinking in one machine tool has decreased the time spent on transporting components, reduced the areas occupied by 150 square meters and conditionally released three individuals.

We have talked here about the main and more important directions along which it is planned to carry out the further technical development of the works. Even this, however, is insufficient to picture to yourself how complicated and voluminous these tasks are and how much creative and persistent work they require to convert them into a fact. The workers in the Novocherkassk Electric Locomotive Works -- the largest electric locomotive building enterprise in the world -- will do everything possible to create a highly efficient modern production facility.

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## RAIL SYSTEMS

### PLANS FOR IMPROVED RAILCAR DESIGNS, FLEET COMPOSITION

Moscow ELEKTRICHESKAYA I TEPLOVOZNAYA TYAGA in Russian No 5, May 86 pp 28-30

[Article by Engineer A. V. Gogolev: "Railcars and Technical Progress"]

[Text] We are continuing to acquaint readers with ways for accelerating scientific and technical progress in industries that are associated with the locomotive one [see "ETT" [ELEKTRICHESKAYA I TEPLOVOZNAYA TYAGA] Nos 3 and 4, 1986].

The intensive development of transportation and an increase in the mass, length and speeds of trains are making even greater demands on the railcar fleet. It must be in good technical condition, have sufficient durability and reliability, conform to the maximum extent possible to the structure and properties of the freight being shipped, as well as provide for the possibility of mechanized loading and unloading. Meeting these and other current demands on railcars on the basis of accelerated assimilation of achievements in science and technology is an important and responsible task that faces railway workers and railcar builders.

Each year the railcar fleet is upgraded with more efficient rolling stock. The industry has completely changed to the output of freight railcars with rolling-contact bearings that are not only more reliable, but also create less train resistance. The maximum allowable load from wheel pairs on the rails was increased to 23, 25 ts [ton-force]. This made it possible to substantially raise the carrying capacity of railcars and, consequently, to improve the efficiency of their use.

During the period ahead particular consideration also will be given to increasing the carrying capacity and tonnage of railcars as a large reserve for increasing shipping volumes with a smaller fleet. Therefore, for the long term eight-axle open railcars and tank cars with dimensions of  $l_{pr}$  and  $T_s$ , which make it possible to marshal trains of increased mass with the existing length of station tracks, i. e. without reconstructing the stations, are finding extensive use. The mass output of improved 4-axle railcars, especially of all-metal covered ones with a body volume of 140-150 meters<sup>3</sup>, flatcars with a length that is increased by a factor of 1.5, tank cars with a large specific volume, and others will begin within the next few years.



In the basic trends of USSR economic and social development for 1986-1990 and the period before the year 2000 it was stipulated to increase the proportion of specialized railcars in the exploitable fleet by a factor of 1.3-1.4. This will reduce freight losses during shipping and layovers of rolling stock for freight operations by virtue of their full mechanization. Self-unloading hopper railcars proved themselves well for shipping cement, mineral fertilizers, grain, coke, peat, coal and other granulated freight. Standardization of these railcars and an increase in axial load to 25 ton-force are provided for in the future.

Specialized railcars for shipping containers, motor vehicles and lumber were created and are operating efficiently. The fleet also is being updated continuously with tank cars for transporting milk, vegetable oil and other foodstuffs. Improved dynamic and strength qualities are typical of railcars in which flour and polymers are shipped. Some types of railcars--especially flatcars for lumber, railcars for motor vehicles, and mineral fertilizer railcars with the use of stainless steel and anticorrosive coatings in the design--will be delivered from Finland.

As is well known, perishable products comprise a large shipping volume on the main lines. In order to improve delivery of them the food program provides for the delivery of tens of thousands of refrigerated and insulated railcars for transportation. Right now five-railcar refrigerated sections of domestic and foreign (GDR) construction are their basic fleet.

For the long term the proportion of individual insulated railcars will increase. Thermos railcars will find use right along with self-contained refrigerator cars for shipping various perishable freight. The advisability is being considered as well on the basis of modern achievements in science and technology for creating ice-cooled and insulated railcars that are refrigerated with liquid nitrogen, large containerized refrigerator railcars, and others.

As to the development of containerized shipping, the structure of the containerized fleet is steadily being improved and the carrying capacity and reliability of these transportation means are being increased. The extensive assimilation of large general purpose containerized railcars that conform to international standards will continue during the 12th Five-Year Plan. The more active development and manufacture of specialized containerized railcars are provided for right along with this.

Right now small and medium containerized railcars in which they ship various granular, liquid and piece freight are being used quite extensively. However, they are highly diverse, have a limited area of application, and do not always conform to the parameters of delivery facilities. The use of large containerized railcars is more promising. This will make it possible to expand the products list of freight that is suitable for containerized railcars, increase labor productivity, and use available transportation and loading-unloading facilities efficiently. Refrigerated ones for shipping perishable products, containerized tank rail cars for liquids, containerized flatcars for piece freight and others that have been mentioned already are included among the large long-range containerized railcars.

So far we have talked about freight and specialized railcars. But what is being done in the railcar industry for improving passenger hauls? In the first place, the delivery of railcars with combined electrical carbon heating that provides for more favorable traveling conditions for passengers and working conditions for conductors, as well as railcars with air conditioning units, will continue. For example, a new compartment railcar with air conditioning and a centralized electric power supply system that receives its power from the locomotive and an individual rectifier is undergoing testing.

The assimilation of series production of new, more comfortable railcars with a length of 27 meters, the creation of interregional bilevel railcars, and the building of new types of railcars with upholstered seating and more improved dining cars and snack bar compartments with self-service are provided for. Modern decorative materials that have an attractive outward appearance and increased fire resistance will find application in the trimmings of the passenger railcars.

They are improving the design and updating the most crucial junctions simultaneously with improving the structure of the railcar fleet and fitting it out with new, more efficient rolling stock. For example, in the near term we are faced with completing conversion of the railcar fleet to rolling-contact bearings, and that will considerably improve reliability of the slip assembly. Converting to bearings out of ShKh4 stipulated hardenability steel and face mounting of them with a washer instead of a nut for improved lubrication are being accomplished with that very aim in view. The use of hollow axles that reduce the uncushioned mass, wheels with improved elastic properties, and other things has a favorable effect on operation of the axle boxes.

Specialists are working on increasing the reliability and extended service life of automatic coupling equipment. Right now all new railcars are being delivered with automatic couplings out of more durable, low-alloy 20GL and 20GFL steel. The thickness of the shaft wall of the automatic coupling's casing was increased from 20 to 22 millimeters, additional internal stiffening ribs were introduced, and the upper and lower strips of the coupler yoke were reinforced.

At the present time passenger railcars, as well as eight-axle refrigerated freight and some other types, are being equipped with a semirigid automatic coupling device. In the future all railcars will be equipped with them, and that will make it possible to reduce the probability of spontaneous uncoupling while the railcars are passing over the gravity humps and facilitate the selection of railcars in terms of the height of automatic couplers' longitudinal axes when trains are being made up. The aligning unit of a new coupling device has an elastic (spring-opposed) supporting structure for the shaft, and it provides for the necessary vertical and horizontal deviations of the automatic coupler and its return to the initial position following the disconnection of railcars.

An increase in the mass of trains and the carrying capacity of railcars, the intensification of station operations, and especially the growth in sorting rates raise among the priority ones the task of improving the design and increasing the power capacity of automatic coupling absorption devices. The majority of 4-axle freight railcars being used are now equipped with Sh-1-TM

devices with movement of 70 millimeters and power capacity of 37.3 kDzh [kilojoules] (3,800 kgs [kilogram weight meters]). The use of Sh-2-V type devices with movement of 90 millimeters and average power capacity up to 50 kilojoules in a running-in state was begun for reducing the longitudinal effects on railcars.

A new, more powerful device for Sh-6-T0-4 freight railcars was created by scientists and by now has successfully undergone testing. It has a casing that is joined with the coupler yoke, and that made it possible to increase the length and the diameter of the spring-loaded complete set and, consequently, its power capacity too. A laminated-type, including with the use of powder metallurgy, version of this device is possible as well. Good results were obtained too during testing of the GA-500 type hydraulic device.

Another long-range design is the PMK-12A plastic, metal powder device, the power capacity of which is 2-3 times higher than those being used at the present time. Scientists and designers are actively working on increasing the reliability and other basic assemblies of railcars.

A major program for increasing the efficiency of the railcar repair base and modernizing and retooling it is projected right along with an improvement in rolling stock during the 12th Five-Year Plan. At railcar depots they have taken a course toward extensive and accelerated assimilation of industrial labor methods, advanced continuous-flow processing methods for repairing railcars and their basic assemblies, high-performance repair equipment, and effective means of testing and technical troubleshooting.

The Krasnoarmeysk, Yasinovataya, Chelyabinsk, Lyublino and other railcar depots have become industrial type enterprises in terms of improving the condition of open railcars. A high level of industrial conditions was achieved at the Likhobory depot where they repair large containerized railcars and at the Georgiudzh depot that performs scheduled maintenance of refrigerated rolling stock.

Improvement in the operation of railcar maintenance centers (PTO), where a guarantee of continuous train traffic is set down, is included among the priority tasks. It is no secret that railcar troubles are still an extremely widespread cause of train delays on a route and of failures during movement. With regard to this the MPS [Ministry of Railways] Main Administration of Railroad Cars developed and at the beginning of last year approved an addition to the standard industrial process of freight railcar maintenance.

It was decided to transfer many labor-intensive operations (replacement of automatic couplers, repair of brakes and axle box assemblies, and others) to specially allocated, well-equipped tracks located near humps in station yards. The experience of the Osnova PTO of the Southern Railroad, the Bryansk-Lgovskiy and Bekasovo PTO's of the Moscow Railroad, and a number of other centers are an indication of the fact that a concentration like this of labor resources and mechanized facilities provides for a considerable increase in the productivity and quality of labor of maintenance personnel, eliminates their tiring passes along rolling stock, and promotes a reduction in train layovers at dispatch yards.

The labor of inspectors and fitters will become efficient, easier and productive by virtue of assimilating automated systems for operational planning and control of PTO operations with the use of computer technology. With that very aim in view it was projected to expand the use of radiocommunications during the inspection of rolling stock. For example, at the Sverdlovsk-Sortirovochnyy station this made it possible to reduce by 25-30 percent the average length of train processing with a simultaneous improvement in quality control. The valuable experience of using self-propelled repair units in rolling stock for repairing railcars is concentrated in the Kurgan and Georgiu-Dezh PTO's.

During the 12-th Five-Year Plan railcar examiners are counting on more active assimilation of technical troubleshooting methods and facilities, especially the DISK-BKV-Ts [expansion unknown] system. In the future with this equipment they will uncover overheating of axle boxes, critical rolling of wheels, undercutting of wheel flanges, jamming of wheels, railcar overloading, deviation of the upper clearance of rolling stock, and other troubles. Computer technology will be used even more extensively for data processing.

It is stipulated to improve the reliability of readings and the efficiency of using existing PONAB [expansion unknown] instruments. Right now they are beginning to use them even more at PTO's for accelerating and improving maintenance of axle box assemblies.

It is necessary to improve the quality of inspecting and repairing brakes and automatic coupling devices by expanding the test run track for handling trains with increased mass. Therefore, at some PTO's specialized crews were created and special tracks for improving the condition of brake equipment were allocated. The equipping of stations with state-of-the-art centralized systems for testing and inspecting brakes with the automation of all basic processes will be continued.

An important role belongs to the mechanized centers for preparing railcars for shipments (PPV) in providing railroads with rolling stock that is in good condition. They will obtain further comprehensive development as well during the period ahead.

Right now at major loading departments they are beginning to introduce a fundamentally new organization for improving the condition of railcars prior to shipments. The essence of it is in the centralized selection of defective empty railcars at one or several reference stations with subsequent routing of them--depending on their condition--to special cleaning and uncoupling or nonuncoupling repair centers. This makes it possible to bring in serviceable railcars immediately for loading and to put defective ones in order more rapidly and qualitatively.

The technical equipping of PPV's is growing first and foremost by virtue of extensive assimilation of "Donbass" and "Likhobory" type railcar repair machinery and pneumatic and electrical power tools. The creation of specialized departments will continue at centers for repairing railcar components and assemblies that are the most frequently susceptible to damage.

A long-range trend is the construction of covered PPV's. Experience like this is accumulated at the Donetsk, Sverdlovsk and a number of other railroads. When improving the condition of railcars in covered buildings or shelters, working conditions are radically improved and the productivity and quality of labor increase considerably.

A multifaceted study that is being conducted in the industry for improving the technical condition of the railcar fleet will provide the proper effect only on condition that its maintenance in operation, including locomotive crews, will be provided for in a reliable manner. The proprietary care of railcars, just as of public property, must become the law too for employees of the various industries and the national economy.

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CSO: 1829/238



# MARITIME AND RIVER FLEETS

## BREAKDOWN OF USSR MARITIME MERCHANT FLEETS AS OF 1 JANUARY 1986

Moscow MORSKOY FLOT in Russian No 6, Jun 86 p 14

[Text] The Registry of the USSR reports the status of the USSR's maritime merchant fleet, with breakdown of the data by ministries and departments as of 1 January 1986 (including self-propelled ships with gross register tonnage of 100 register tons or more):

TYPES OF SHIPS	Ministry of the Maritime Fleet			Ministry of the Fishing Industry			Ministry of the Gas Industry			Others			In All		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Passenger and Passenger-Cargo	212	683 347	194 562	9	2600	802	57	21 487	3541	16	6005	1101	294	713 439	200 006
Including: Ferries	54	266 077	78 561	—	—	—	—	—	—	—	—	—	54	266 077	78 561
Dry Cargo Ships	1488	9 496 703	12 765 742	507	1 615 910	1 589 177	10	18 209	23 579	272	497 705	596 716	2277	11 628 527	14 975 214
Including:															
Timber Carriers	345	1 429 294	1 997 386	1	4499	6605	2	9628	13 560	—	—	—	348	1 443 421	2 017 551
Container Ships	50	524 590	525 272	—	—	—	—	—	—	—	—	—	50	524 590	525 272
RO-RO Ships	62	443 807	541 145	—	—	—	—	—	—	—	—	—	62	443 807	541 145
Tankers	310	4 184 788	6 392 465	98	237 038	301 136	4	96 885	158 820	5	13 438	17 489	417	4 532 149	6 869 900
Including:															
Oil Tankers	284	3 964 532	6 149 738	79	202 109	258 971	2	93 502	155 500	5	13 438	17 489	370	4 273 581	6 581 698
Gas Tankers	11	186 625	201 519	—	—	—	—	—	—	—	—	—	11	186 625	201 519
Combination Ships	11	688 003	1 194 432	—	—	—	—	—	—	34	91 658	97 189	45	779 661	1 291 621
Fishing Ships	1	502	320 2640	3 505 565	1 931 121	2	352	154	5	3122	1473	2648	3 509 541	1 933 068	
Special Purpose	55	202 331	134 739	209	1 506 095	1 188 978	34	23 214	7768	149	232 067	104 450	447	1 963 707	1 435 935
Technical Ships	206	198 897	158 747	31	18 991	9452	44	161 001	64 744	154	124 363	89 842	435	503 252	322 785
Auxiliary Ships	532	477 813	352 535	349	147 484	114 910	113	138 643	93 161	119	47 337	22 188	1113	811 277	582 794
Including:															
Tugboats	287	92 013	33 652	199	81 719	35 136	33	21 790	9280	78	29 758	14 150	597	224 780	92 218
Icebreakers	37	235 988	105 404	—	—	—	—	—	—	—	—	—	37	235 988	105 404
TOTAL	2815	15 932 384	21 193 542	3863	7 033 683	5 155 566	264	459 791	351 767	754	1 015 695	930 448	7676	24 441 553	27 611 323

KEY: (1) Number of Ships (2) Gross Register Tons (3) Deadweight Tons

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## PORTS AND TRANSSHIPMENT CENTERS

### VAZHINY PORT ON SVIR RIVER TO BE OPERATIONAL BY 1987

Moscow RECHNOY TRANSPORT in Russian No 2, Feb 86 pp 40-42

[Article by N. Vinogradova under the rubric "Construction Sites Under Control!": Vazhiny Port on the Svir River"]

[Text] Moscow-Leningrad--The Vazhiny transshipment port is one of the most important projects being built in river transport in the 11th Five-Year Plan in accordance with the resolution of the CPSU Central Committee and the USSR Council of Ministers "on measures for the development of river transport from 1981-1985." The priority facility of the port, which is designed to handle 350,000 tons of cargo, is being put into operation in 1986.

#### Economic Base and Calculated Freight Turnover

The construction of a transshipment port in the northwest region is stipulated by the creation of a consolidated deepwater system for the European part of the country and by the development of transport in vessels for combined "river-sea" navigation. An analysis of existing transport links, a cargo delivery model for this rayon (Leningrad and the oblast; Novgorod and the oblast; the Karelian ASSR; Volgograd Oblast; Murmansk and Arkhangelsk by transit connections; and the Volga and Kama rayons) as well as an analysis of the future development of the national economy and the growth of freight flow and transport expenditures (by railways and waterways) which is connected to this growth have made it possible to clarify the attraction to river transport as well as the economically profitable ship transport of coal for enterprises in Leningrad and Novgorod and iron pyrites to chemical enterprises in Kingisepp and Novgorod. Furthermore, the transport of export timber cargo on the Saimaa Canal in Finland is economically expedient. The local transport of both logs and mineral and building materials is also acknowledged to be profitable by planning studies.

The implementation of a technical and economic base by Leningrortrans confirmed the expediency of the construction of a transshipment port in the northwest of the country in the Vazhiny settlement on the right bank of the Svir River 14 kilometers from Podporozhye which is in the Leningrad Oblast. The port is located at the intersection of main railway lines and is the center of the Kolskiy Peninsula and Volga-Baltic Water System. Its projected freight turnover is 3.3 million tons per year. Cargo will be delivered in ships with a 5000 ton

carrying capacity (projected 1565) and in the future in sectioned ships with a 7460 ton carrying capacity.

In compliance with the TEO [Technical and Economic Base] the port's entry into operation will make it possible to relieve the Leningrad and Vyborg deepwater sea berths from handling river vessels as well as to use them in the future for handling the growing volume of export cargo. This is particularly important for the Leningrad seaport which is situated in a densely populated part of the city where there is no opportunity for development due to a lack of free space. Meanwhile, the construction of the new port will make it possible to eliminate that portion of the fleet which goes under the Neva drawbridges; it will free up ship time particularly for "river-sea" vessels and will relieve the Nizhnesvirskiy Hydro-Transshipment Center from locking ships which will be handled up to its section line range (1.8 million tons). The construction of the port will also facilitate the better utilization of the freed up tonnage for bulk cargo transport.

The basis of the construction of the Vazhiny harbor railway terminal is as a port component which connects the cargo berths with the Svir October Railway Terminal; the renovation and development of the terminal are stipulated by the calculated cargo turnover. A road also connects the port with nearby population centers.

The period of time specified by the plan for the repayment of capital investments in the construction is 8.9 years. It is typical that the economic indicators of the Vazhiny port are higher than those of the Cherepovets port.

The construction of the Vazhiny port is being directed by the Northwest Shipping Company (client); Sevzapstroy, and Sevzapmorgidrostroy trusts, contracting construction organizations; and Leningprorechtrans, a planning organization.

#### Technical Solutions

The cargo berths of the port are 640 meters long and are designed with a vertical section of mass masonry which along with the subsequent monolithic superstructure weighs 40 tons.

In the course of the planning work, several models for the mechanization of transshipment operations were examined. On the basis of a comparison of variables according to cargo handling costs, grab bucket bridge cranes mounted on cantilever trestles were recommended.

The utilization of one type of transshipment engineering is the distinctive feature of the adopted mechanization design. In the future as well, the universality of the equipment will make it possible to transfer other cargoes without altering the recommended technology; the transfer of pellets and limestone, for example, will facilitate the development of the port's cargo turnover.

At the cargo berths, it will be possible to handle four motor ships simultaneously. In view of the planning work, various technological models for cargo transfer were adopted: ship--crane--railcar (on fore-apron tracks); ship--

crane--railcar; apron area warehouse--crane--rear services area warehouse. The trestles for 22 bridge cranes have 17 spans which cover the breadth of the rear services area and the railroad loading facility. An over-the-water cantilever with a breadth of 20.5 meters (by the adopted technology for cargo shift) makes it possible to load and unload ships with the minimum number of ton operations. If the need arises to concentrate several cranes at one span in the process of port operations, a special traverse carriage with operational hoists, which was developed by the specialists at "Lengiprorechtrans" in the course of planning work, is envisaged.

Bulldozers which are put into the hold by these very same bridge cranes clear the ships of bulk cargo residue. Brushing machines, which are being tested at the Gorkiy port, are proposed for clearing the railroad tracks. The machinery has an overall capacity of 1458 kilovolts. The circumstance that the Vazhiny port will be equipped with one type of crane will make it possible to work out the automation of the transshipment process. The ASU TP [Commercial Port Automatic Control System] of the mechanized facility will enable an operator to control three cranes from a central stationary cab; moreover, its functions will be included in the task of the operations program and in the control for system operations.

The introduction of a number of automated hubs was a prerequisite to the full automation of bridge crane operations; of relevance to this is an automated grab bucket device which makes it possible to automate the cargo grappling process and the opening and closing of the grab bucket; a weighing device to help carry out a material inventory and to implement, in an automated operation, a soft landing by the grab bucket on the cargo as well as the clearing operations in the hold; a tracking device for the deflection of cargo ropes; and an electric drive with thyristor control which ensures the production of the necessary stop-start characteristics. The introduction of ASU TPMK [Commercial Port Magnetic Card Automatic Control System] will make it possible to raise productivity and the quality of transshipment operations and to ensure the operation of the system in an optimal technological production routine. One operator will replace three crane operators; his work place is envisaged in a stationary cab with improved conditions (air conditioning, and anti-noise device, etc.).

The dimensions of the warehouse areas make it possible to accumulate cargo in the port and to store it between shipping cycles. In order to prevent coal and timber piles from scattering, movable, reinforced concrete restraining walls and stanchions are planned. The plan envisages standardized equipment for weighing railcars and their load weight, as well as rolling devices to compact coal in order to reduce losses from surface blow-off by the wind. Fork lifts with jaw clamps and forks as well as conveyors are envisaged, apart from cranes, for the transfer of timber cargo to the berth.

#### Environmental Protection

The planners paid special attention to measures for the protection of the environment (water, air and soil) from pollution.

The interest is represented in a system of water spray dust prevention which envisages a reduction in the air content of harmful coal dust to maximally



allowable concentrations. The water supply equipment is placed at coal dumping sites and where coal is loaded and unloaded from railcars and ships. The water absorbs the dust by wetting and moistening the coal and irrigating the trestle zone. The water spray dust prevention system is automatically switched on during bridge crane operations.

The design of protective folding deflectors which cover the clearance between the ship and the berth should also be noted. The design, in the form of a hinged span, makes it possible to prevent coal, iron pyrites and wood bark from falling into the water.

A system for water supply circulation is envisaged. To this end, all production and storm run-off from the area is collected in special tanks and goes through a local treatment unit (a water purification works facility with a "jet" spray unit with a 3200 cubic meters per day capacity) and then is directed to the water spray dust prevention system as well as to technical needs.

Industrial and domestic run-off from the port buildings and the Svir railway terminal are pumped to the Svir shipyard biological purification works which has a markedly increased production capacity. A specialized berth for the receipt of domestic wastes from ships is being constructed at the port. The plan includes collection waste water at floating terminals in individual tanks and sending it to floating purification terminals. In order to prevent fish from getting into the water intake works, trap nets and grates are being installed.

#### Administrative and Management Facility

The construction of a building complex, installations and engineering networks is envisaged to ensure the operational activity of the port and the creation of normal sanitary and domestic conditions for the workers. The complex of production, administrative and domestic buildings is planned on the basis of standard plans for the maximal interlock of hubs and includes port and domestic buildings, a dining hall, a medical clinic, engineering repair shops, a garage, a technical communications facility as well as well-built residential units.

#### Editorial Afterword

By planning-estimate documentation, the standard period of time for construction is specified for 60 months (10--preparatory, 50--basic) and as envisaged by the resolution, the port would be in operation in 1985. At the present time, however, only part of the port is operational, the so-called priority complex which consists of cargo berths which are 290 meters long, engineering networks, the Vazhiny harbor railway terminal, sidings and part of the administrative and management facility.

Why Is It That Just The "Priority Facility" and Not The Port Is At The Planned Capacity?

This is what is revealed in the course of a discussion with L.I. Polyashov (Lengiprotchtrans), chief engineer of the project; G.B. Yegorov, deputy chief



of SZRP [Northwestern River Shipping Company]; A.I. Chernetsovskiy (client) OKS chief [Capital Construction Department]; and B.V. Lesogorov, chief engineer of the Sevzapmoregidrostroy trust (a contracting organization).

One of the reasons is the breach of calculated capital investments for each year which are subject to operational use. They didn't exceed 5 million rubles and the lag was cumulative over the course of the five-year plan.

Underlying this is, first of all, the practical work of the customer agreement with the contracting construction organization on the volume and distribution of work. As the analysis showed, the operational work volumes which are proposed by the client for the upcoming year are consistently not coordinated with the builders and as a rule, corrections were made only on the side of reduction.

All this leads to the fact that during the five-year plan, construction and installation work was fulfilled at two-thirds the established limit.

The determination of the trust's planning assignment according to the financial base has had an adverse effect at precisely this stage of planning; in it, the manufacture to working status alone (in thousands of rubles) is the basic calculated indicator. As a result, projects which require the implementation of complex, labor-intensive operations are not included in the yearly plans; these are engineering networks and communications, and the installation of specialized equipment, in other words, projects which don't fit the basic purpose of the contracting organization. This is precisely the situation that has taken shape repeatedly in the construction of the Vazhiny port. The conclusion suggests itself; it's necessary to give project engineers, clients and builders the opportunity to operationally introduce refinements to the task in the course of the construction in accordance with the labor intensiveness stipulated for the construction project.

The current planning system hampers the use of the achievements of scientific and technical progress as well as the use of new technologies which were put into the plans. For example, for a number of years, project engineers for harbor quay development in ports have been proposing an embankment structure of sheet pilings using precast reinforced concrete; the structures are proposed as more economical, less expensive and operationally suitable.

However, in spite of an agreement with the contracting construction organization on the planning estimate documentation and work volume, builders persist in changing the berth design and as a rule, they propose the substitution of mass masonry structures. The port of Vazhiny can also serve as an example. Builders justified this as an established, worked-out technology for the quick preparation of masonry bodies, although they are also more expensive structures.

In order to interest builders in the application of economizing and progressive designs, it's necessary to scrutinize the development (renovation) of the capabilities of the contracting organizations at the TEO [Technical and Economic Base] and planning stage.

It's very likely that in individual cases, it's best to plan the specified time for putting berths into operation not by the calendar date but by the start of shipping in order to enable the on-time preparation for operations.

There are delays in the construction process and the delivery of equipment and materials is late as well. There is an indication of such an example at the Vazhiny port; the two bridge cranes needed for installation will be supplied to the client by the manufacturer in the 1st quarter of 1986 according to a USSR Gosplan multiple purchase order. At the priority facility, many parts and equipment were also delivered late. Thus, the shift in the specified time for the delivery of bolting devices for the pipeline networks from the 3d to the 4th quarter led to the fact that the inspection of the water line turned out to be more prolonged and labor-intensive in cold weather conditions.

The work experience of the group for equipping construction projects which was created by the SZRP [Northwest River Shipping Company] and has been in operation since 1983 is interesting. A group of three men compiles the equipment and materials orders which are received via the USSR Gossnob area equipment and technical supply and in particular, the management of Lenkomplekt. The protection of ordered equipment is a complicated matter since clear cut indications of its use at priority facilities alone are needed. The practical experience of this group's work over the course of two years shows that the basic approved equipment is delivered, as a rule, within the established time period. Unfortunately, there is no such specific approach to the delivery of equipment and materials to priority construction sites on the part of Minrechflot [Ministry of the River Fleet], although this is quite necessary. The creation of an analogous equipping group in the SFSR Minrechflot [Ministry of the River Fleet] would make it possible to set up strict controls on the use of equipment at priority projects and to implement on a broad base and more qualitatively, construction operations, as well as to more quickly bring an installation up to the assigned capacity and as a consequence, to reduce the above-the-norm supplies of equipment and materials.

The construction of a multi-faceted port with a railway terminal component which has the distinguishing feature of being equipped by other sectors, in particular, with the MPS [Machine and Track Station], requires an agreed upon and mutually sustained approach to the supply of such equipment. For example, there will be great losses from the wait for switches which are used only on railroad tracks but were not delivered to the Minrechflot [Ministry of the River Fleet]. Completion groups for priority construction projects could more practically and opportunely order, in a centralized fashion, new equipment which had not been used earlier and is not profiled for the sector; the group could refer it to projects.

The development and technical re-tooling of the "Svir" railway terminal in 1986 is not envisaged with the aim of increasing her through-put capacity, although the capabilities of the contracting construction organization Sevzapstroy (Mintransstroy) [Ministry of Transport Construction] will make it possible to implement the necessary operations. The situation has been created where the local interests of the contractor prevail over national economic port use efficiency and at the present time, a "second priority facility" variant of the

Vazhiny port is proposed with a supplemental berth length of 150 meters; there would be no increase in cargo turnover since the addition throughput of the Svir railway terminal will not be more than 350,000 tons of cargo. The Sevzapstroy trust needs to find reserves and complete the work on the Svir railway hub at the indicated volumes in order not to create delays in the port's entry at the planned capability.

An analysis of implemented operations, the outlay of capital investments and the availability of construction organizations' capabilities makes it possible to conclude that the Vazhiny port will be navigational in 1987. As a result, the conditions exist, in the northwest basin for the increased role of river transport in the improvement of transport service in the national economy.

It's important for the ministry organization to resolve all questions on the full delivery of crane equipment.

When the issue was laid out, I.A. Ogibin, chief of the Main Cargo Administration of the Minrechflot [Ministry of the River Fleet] informed the editorial staff that in the near future, the following traffic flow will be operationally possible at the Vazhiny port; 200,000-300,000 tons of flux for the Kostomukshskiy Combined Ore-Dressing works, .5 million tons of iron ore pellets for export and for the country's iron and steel industry enterprises, and .5 million tons of crushed rock with a subsequent increase to 1 million tons from the quarries in the Karelian ASSR and the Leningrad Oblast for construction sites in the Central, Volga region and Arkhangelsk Oblast.

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## PORTS AND TRANSSHIPMENT CENTERS

### YALTA PORT IMPROVEMENTS UNDER WAY

Moscow VODNYY TRANSPORT in Russian 10 Jul 86 p 1

[Article by V. Litvak: "Outside the City Limits"]

[Text] A new cargo section has begun operation at the Yalta Commercial Maritime Port in the Massandra area. It is located at the side of a health resort zone, which is particularly important under Crimean conditions.

"Honestly," says R. Papakin, chief engineer of the Port of Yalta, "just a year ago we did not even hope that the construction workers would cope with their assignment. There were days when a total of two or three persons were working here. But by the end of the five-year plan everything stood in place, and in 1985 all the work for the first section of the construction was practically completed. Some 156 running meters of mooring, an administrative-everyday wing, two pump houses--water supply and sewage--reservoirs and storage areas have been put into operation."

The new cargo section has already begun to fulfill its basic function--it is receiving vessels of the Volga-Balt series. Not enough. So far we have been engaged only in unloading the vessels, and now we ourselves are beginning to deliver to other ports rubble extracted at the Sharkhinskiy quarry. It is needed for construction work in Nikolayev, Kherson and other Black Sea ports. In the near future, after modernization of the first port mooring, where cargo was stored before, passenger liners of any displacement and dimensions can be moored there.

We go to a new area with V. Likhidko, chief engineer of the Crimean port project: a high protecting jetty, comprised of a fill made of concrete blocks, and from the aquatorium side--a wall made of a continuous row of reinforced concrete shells. Part of the blocks are installed with the idea in mind that a convenient habitat could be found there for goby, mussels, crabs and other Black Sea fauna. A narrow jetty adjoins the wall--a convenient place for the deposit of fishermen's seiners and boats in the fall-winter storm period. The water depth alongside it makes it possible to moor there, if necessary, even passenger motorships of the Uzbekistan type. The wall is calculated to withstand the strongest storms for 100 years.



An innovation was used in its construction--a device to link the cargo mooring with the shore by means of special wave-suppressing boxes. The authors of this invention are specialists from Chernomorniiprojekt and Krymmorgidrostroy. Special 35-meter sections of the mooring were made, from which the ship collectors of polluted water could feed these wastes into special sumps.

The longshoremen are adequate for the quality of the hydrotechnical structures built. The matter is somewhat worse with respect to the auxiliary buildings and facilities. A. Matskevich, chief of Construction Administration 459, answered my questions as follows:

"There are many problems facing us, the construction workers. In the first place, the main one is the shortage of work hands. Our main purchaser is the Crimean Anti-Landslide Administration--and after all, protecting and reinforcing the shore is a problem of singular importance and paramount not only for the Crimea, but also for any other section of the Black Sea shoreline. Therefore, for construction of the port, a comprehensive brigade was singled out, under the direction of the experienced hydraulic engineer I. Derebrinko. Some 15 men--concrete workers, carpenters and welders--worked at the construction site.

"These are, of course, very few for this work, and only in winter, when a large part of our fleet was laid up, could we single out an additional number of people. Besides, we are really just hydraulic engineers, and have no experience in general construction work. All the planned projects, however, were turned over to the purchasers with a good evaluation, and in the planned period of time. Now the work on completing the objects of the first section is proceeding, even with some advance on the schedule."

So--the Yalta Port has already been freed of cargo operations. In 1987 work will be developed at the new cargo division on construction of objects for the second section.

Now, in order to carry out even the most necessary repair of the equipment operating at the cargo division, this equipment must be brought to the port. Neither the purchasers nor the planners provided for this detail. Boats under repair so far anchor at the municipal mooring, hindering the normal rest for people and the work of the hotels, stores and attractions adjacent to the site.

Added to the development of the second section was the task of lengthening the cargo mooring so that cargo operations of two Volga-Balt type vessels could be carried out there at the same time. In the plan which they showed me at the technical construction administration for the port, there are still dozens of particularly important objects, the construction of which should be completed by the end of the five-year plan.

Departure from the materials handling area is even now, in dry weather, made difficult for motor vehicles due to the sharp ascent of the road bed from the alleyway. Under winter glazed ice conditions, continuous jams and transport breakdowns will be created here. The planners are already solving the problem, but time will not wait--that section is in operation.

All this is in the future. Now the construction workers have turned over a new cargo section for operation, at which work is already in full swing. A 20-story residential building with 48 apartments in Massandra and a 60-unit apartment house in the city have been put into operation. A new child care center for 280 children is in operation and the Mayachok day nurseries have undergone major repair. A famous workers' museum for the port workers has been arranged through the efforts of the repair-construction administration.

The port anticipates a stepped-up work life. And the city--the city is freed from unnecessary noise, roars and dust filtering everywhere, and invites as guests those who wish to take medical treatment and rest by the sea.

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## PORTS AND TRANSSHIPMENT CENTERS

### CONSTRUCTION LAGGING AT NEW NOVGOROD PORT

Moscow VODNYY TRANSPORT in Russian 15 Jul 86 p 2

[Article by V. Martyshin: "Optimism With Nuances"]

[Text] Construction of the Novgorod River Port was begun in 1981 and was planned to be turned over for operation in 1984. To date only one-third of the capital investments has been utilized. Guilty of being among the ranks of the delayed was the construction project of general contractor SU-265 of the Novgorodkhimstroy Trust No 43 of the USSR Ministry of Construction. Is this seen as an area of lengthy construction?

We reached the new port being constructed in the settlement of Derevyanitsa by motorship along the Volkhov.

"The existing port looks practically the same as it did in the postwar years," explained Chief V. Petrov. "At that time it was one of the leading enterprises in the city and the oblast and the technical equipment level met the requirements of the time. Now, however, the material base has become quite obsolete. It is totally inferior to all the adjacent territory with respect to public services and amenities. That is why the master plan for development of the city long ago specified transferring the port to new territory. It is for this reason that it has not been modernized."

...Only half an hour had passed, and the wing of the new construction site rose along the route of our motorship. Trucks were driving up, the excavator, digging a trench, rumbled with effort and a bulldozer worked at top speed in a foundation pit. A tower crane rising above the main shop worked untiringly. Welding flashes along the construction site produced an extensive front. There was no doubt--work was going at full speed. We were convinced of this shortly after, when passing along the construction site and wings with S. Spirinyy, port director and chief engineer.

"Work has noticeably livened up this year," said Sergey Vasilyevich. "The construction workers fulfilled the half-year plan in five months, and took on the commitment to utilize the year's volume of capital investments and prepare the work front for installation of equipment and interior finishing by September. I think that they can do this if the construction rates are maintained. Then

the port will be able to go into operation by next year. By the way, this will be a repair base rather than a port. For the most part, really, our fleet will be engaged in transshipping nonmetalliferous construction materials, and operates 90 percent at the moorings of the clientele. Putting the repair bases into operation expands the possibilities of the Novgorod river transport workers. We will be able to operate larger vessels and machines. The construction of barges and other types of vessels can be developed here in the future. After all, we now have an excellent four-road slipway at our disposal."

The slip is already practically ready for operation, and is temporarily closed. The installation workers putting in the equipment in the control panel facilities are making the finishing touches on it. The berth is ready for operation and is built according to the latest word in technology. Construction materials and machines are already being unloaded at it now. Installation of the portal crane will begin here soon.

The Novgorod citizens think that the work volume being carried out is the first stage so far in improving navigation on the ancient waterway. In the future the port will be expanded.

"We could considerably increase the product list of cargoes transshipped next year," says the port director. "There is a need for this. It is difficult for the railroad to cope with the transshipment volumes proposed for it. Unfortunately, however, the designer--Lengiprorechtrans--deprived us of this possibility even at the developmental phase. After all, our economy will now be on the right bank of the Volkhov, but the railroad breaks off on the left bank. Despite this, however, we hope that both the quantity and the product list of cargoes will increase. Our hopes lie with the motor vehicle drivers, with whom we have already been working for many years, in agreement and with good contact."

These days, when work is in full swing at the construction site, it would appear that this lengthy construction project never had a sad story. It seems as if the planning meetings, which we were able to attend, had always gone just as efficiently. G. Kosolapov, deputy chief of the trust, inquired very exactly about fulfillment of the plan indicators. But again it was heard: no concrete rings had been delivered, there was no brick, the MAZ had broken down ....

Here you sense in full measure how the failure of one small unit adversely affects the course of construction as a whole. Mechanization Administration No 214, for example, promised all winter to allot an excavator and a dump truck, but they appeared only in spring, when it was already impossible to do the earth work. In the years of the construction project, hundreds of such lapses pile up and postpone the deadlines for turning the project over to the purchaser.

Still, what are the main reasons for the Novgorod Port falling into the category of lengthy construction? After all, this construction project is important for both the river transport workers and the city: every year the Ministry of the River Fleet allotted capital investments, perhaps even somewhat to the detriment of other projects. The river transport workers provide the city and oblast with



70 percent of the construction materials, the significance of which is also indicated by the fact that the port construction is now under the supervision of the party obkom.

"But what is 500,000 rubles of development for an organization which does 18-20 million worth yearly--a drop in the bucket," The port chief explains the reasons for the construction delay this way.

"It means that there were more important projects," G. Kosolapov answers my question.

Yes, unfortunately, here and there the practice still exists of fulfilling the plan indicators in the overall volume of financial indicators, but not the commitments agreed upon for each individual project.

Is there, however, any certainty that work here will continue at the necessary rates and the sad story of the lengthy construction will not be protracted?

"Everything depends," says G. Kosolapov, "on whether the Ministry of the River Fleet includes this construction project in the plan for projects launched for next year. If it does--we will finish it."

The general contractors are in an optimistic mood. This is so far confirmed by the entire course of work at the construction site, but there are too many organizational nuances which can affect the entire course of the matter.

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## PORTS AND TRANSSHIPMENT CENTERS

### KANDALAKSHA PORT DEVELOPMENT PLAN FAULTED

Moscow VODNYI TRANSPORT in Russian 26 Jul 86 p 2

[Article by S. Yefimov, chief of the Kandalaksha Maritime Commercial Port and Yu. Pafurin, chairman of the Brigade Leaders Council, winner of the Soviet Trade Union Prize imeni A.I. Petrash: "With No Regard For the Future: The Planning and Modernization of the Kandalaksha Port"]

[Text] For many years our port has occupied a notable place in the economy of the area. With the increase in the volume of transshipments for the Norilsk Mining and Metallurgy Combine and particularly after the Volga-Baltic Waterway imeni V.I. Lenin was put into operation, its role has increased even more: along with the traditional, locally important cargoes, hundreds of thousands of tons of Arctic cargoes, coal for the Kirov GRES [state regional electric power plant] and iron ore concentrate for Cherepovets and Magnitogorsk have been moored there.

The growing volumes of cargo processing could not be ensured without modernization, and from 1960 to 1973, five crib moorings, a general cargo warehouse and a specialized unit to transship iron ore concentrate were modernized or newly constructed. The port acquired means of mechanization for materials handling, and this has made possible a considerable rise in the level of complete mechanization. Apartment houses were constructed for the port workers and a dining hall and child care center for 280 children were put into operation.

A great deal was done through the port's own efforts. Since vitally important projects were excluded from the itemized lists in order to "reduce the price" of modernizing the port, or as "not deserving attention", machine shops, a garage, materials and equipment supply and fuel and lubrication materials warehouses and a service station were constructed, and tens of thousands of square meters of open, hard-surfaced areas and a number of other objects were developed. We tried, by doing this, to "move up our home front forces" and compensate for or in some measure alleviate the shortcomings in the renovation.

What we have done, however, does not arouse a sense of satisfaction in us. All these years the port's development has gone on without a master plan. The decisions made concerning its modernization have not always been noted for being well thought out. There are many examples of this.

A specialized unit to handle iron ore concentrate, developed over 12 years ago, has so far not even got past the planning boundary, for the simple reason that the rest of the links in the transport conveyer line (fleet of the Ministry of the River Fleet and the capacities of the Cherepovets GMK industrial port) have not, in their time, been properly developed, and as a result the fixed production capital, worth several million rubles, has been 50-60 percent utilized all these years. The specialized unit is operating at a loss.

The harbor front modernization was planned in the 1960's without any regard for the future of the development of the fleet engaged in Arctic transshipments. Several years after the mooring modernization was completed, we sounded an alarm: the fleet of the Murmansk Shipping Company began to be filled up with large-tonnage vessels, which we could not process efficiently; neither the depths at the moorings nor the structures made it possible. We were faced with an obvious miscalculation on the part of the specialists of Lenmorniiprojekt who, when carrying out the plan, in pursuit of a reduction in cost, did not take into account the fact that the moorings of the Port of Kandalaksha had to be calculated to receive vessels with increased draft, and thus placed the port in a complex position.

The year-round navigational period made us adjust to its elemental nature. We never really knew in advance how many vessels would be directed to Kandalaksha in mid-season. There is now possibility of calculating the specific number of dockers for their processing. The relatively brief, but unpredictable intervals between vessels make it impossible to turn the dockers over temporarily to other organizations, but it does not always happen that their highly paid work is ensured in winter. Year-round activity at the port forces equipment to be repaired all year as well. Mooring the vessels without tugs, those unsuitable depths at the moorings and other things entail a mass of insoluble problems, chief of which is the problem of the dockers' employment.

We took heart when, several years ago, there was talk of modernizing the port in connection with the intended operation of lighter carriers in the north. The initial plan was estimated at over 60 million rubles. Then it was cut to 3 million, and then the question of modernization was dropped completely from the agenda, and the planning documentation, at a cost of over 175,000 rubles, was written off.

Planning documentation for a pressure sewage collector from the port to the municipal purification works, the cost of which was also estimated in more than thousands of rubles, suffered the same fate a few years ago.

The course of events shows that the problems facing the port are our problems only and there are few people interested in them for the most part. Requests for assistance arouse no reaction other than exasperation. A conference with Deputy Minister B. Trunov in June of last year was compelled to point to the fact that V. Ignatyuk, at that time chief of the Murmansk Shipping Company, had paid little attention to problems of loading at the shipping company ports, and it was suggested to him that he take appropriate measures directed toward ensuring the development and normal loading for the ports--particularly--the Kandalaksha port.

Lenmorniiprojekt has also taken the stand of a detached observer. Its representatives pointed out that the existence of a mooring in the port did not take into consideration processing large-tonnage vessels. The institute issued no recommendations to ensure the safety of their processing and even refused to agree to the "Provisional Measures To Create Safe Conditions for the Sailing and Anchorage of Vessels in the Port and Preservation of the Moorings," worked out by the port. This sort of thing probably occurs because of the fact that there not enough people interested. This example will confirm what has been said.

Last year, documentation was drawn up for modernization of the mentioned berths Nos 3 and 4. This is what is needed. The plan for organizing the construction, however, stipulated excluding the berths from operation during the entire modernization period, and this entailed complete cessation of processing vessels with Arctic cargoes for three to five years, reduction of the transshipment volumes and, as a result, dismissing up to 40 percent of the dockers. It was assumed that after the modernization work was completed, we would take on new people, train them, provide them with housing, etc. The port collective could not agree with this method of carrying out the modernization, rejected the proposed plan of construction organization and suggested seeking ways to permit the main staff of skilled workers to be retained. It must be noted that before this stand of Lenmorniiprojekt there was another one: it was thought that modernization of the berths should be preceded by the construction of a single deep-water mooring. We, the port workers, shared this scientific opinion.

We feel the lack of proper attention to our needs and troubles at every step. Production projects important for the port, acutely needed housing and social, cultural and everyday living projects are excluded from the itemized lists each year. Everyday facilities have been under construction in our port for almost 20 years. Even after a design for including a block of everyday facilities in the construction plan was developed, its building was carried out at a snail's pace, with the obvious connivance of both the shipping company and local organs. Only the intervention of the newspaper PRAVDA (after a letter from the workers) in January of last year forced a revision of the attitude toward this project, and we count on the construction workers' finally presenting it to us for acceptance this December.

All this lack of system occurs, in our opinion, because of the lack of a master plan for the development of the port, drawn up with regard for the future, on a scientific basis and eliminating elements of chance and libertarianism.

A master plan for development of the port will remove many unclear questions and will enable the collective to build its work in accordance with a plan, in consideration of the near and distant future, and with realization of the demands for accelerating social and economic development of the enterprise on the basis of introducing the achievements of scientific-technical progress.

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